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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LUHRS, MICHAEL K	

ART UNIT	PAPER NUMBER
2824	

DATE MAILED: 07/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/757,638	LI ET AL.	
	Examiner	Art Unit	
	Michael K. Luhrs	2824	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *11-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☒ Claim(s) *8-10* is/are objected to.

8)☒ Claim(s) *1-20* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *16 April 2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *search history*.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-10, drawn to method, classified in class 438, subclass 686.

II. Claims 11-20, drawn to system, classified in class 118, subclass 665.The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process can be facilitated by super critical CO2 i.e. CFD (Chemical Fluid Deposition) i.e. CVD reactor having high pressure manifold.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Linda Lu on 7/16/04 a provisional election was made without traverse to prosecute the invention of Group I method, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-20 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Objections

5. Claim 9 is objected to because of the following informalities: The "monitoring of rate of deposition of the platinum precursor gas" relationship with "the monitoring the rate of the deposition of the platinum layer" in claim 8 is unclear. Should there be no intended relationship, then suggest changing "wherein monitoring" (line 1, claim 9) to --comprising monitoring--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Hicks et. al. USPN 5,130,172.

Regarding claim 1, Hicks et. al. teach: *(i) positioning the semiconductor device within a chemical vapor deposition chamber*, as substrate silicon wafer (line 50, column 7) was mounted (line 58, column 7) in glass (CVD) (line 47, column 7) reactor (line 58, column 7); *(ii) introducing a platinum precursor gas into the chemical vapor deposition chamber for a first period of time so as to deposit a platinum conductive layer on the device*, as precursor compounds of list in lines 52-63, column 6 to form platinum film (line 68, column 7), *(iii) introducing a reactant into the chemical vapor deposition chamber for a second period of time, so that organic waste compounds contacting the platinum conductive layer are removed to thereby facilitate subsequent deposition of the platinum conductive layer*; as hydrogen gas (line 65, column 7), without causing the ligands to be formed on the substrate (lines 32-35, column 10), *and (iv) continuing acts (ii) and (iii) until the conductive layer of a desired thickness is achieved,* as continued for one-half to three hours for a thickness of several thousand angstroms, (lines 2-4, column 8).

Regarding claim 2, Hicks et. al. teach: *the method of Claim 1, wherein introducing the platinum precursor gas into the chemical vapor deposition chamber comprises introducing a platinum precursor gas into the chemical vapor deposition chamber wherein the platinum is bonded to a methyl compound so as to improve the step coverage of the platinum precursor gas when forming the conductive layer*, as compounds (a), (b) or (c) (in lines 52-54, column 6) wherein "Me_3 " is 3 methyl groups in compounds (a), (b) and (c), and wherein (c) also shows an additional CH_3 (methyl group), are all precursors, wherein example 2, line 60, column 7, the compound is vaporized , i.e. is in gas form.

Regarding claim 3 Hicks et. al. teach*: the method of Claim 2, wherein introducing the platinum precursor gas comprises introducing a (methylcyclopentadienyl trimethyl) platinum gas into the chemical vapor deposition chamber,* as compound (c), (listed in line 54, column 6), (see also $MeCpPtMe_3$, in line 57, column 10 and line 64, column 11) is *methylcyclopentadienyl trimethyl platinum* as vaporized in line 60 column 7 is thus *gas* form.

Regarding claim 4, Hicks et. al. teach*: the method of Claim 1, wherein introducing the reactant into the chemical vapor deposition chamber comprises introducing the reactant both simultaneously with the platinum precursor gas and sequentially to the platinum precursor gas*, as compound (a) introduced in one port while hydrogen to another port into the chamber vessel (lines 60-65, column 7), and the hydrogen is held (in line 55, column 7) first, expresses a sequence of hydrogen, then hydrogen simultaneous with the compound (a), [or any of compound (c), (d) or (e) (as expressed in lines 19-20, column 8)].

Regarding claim 5, Hicks et. al. teach*: the method of Claim 4, wherein the reactant is a reducing agent,* since hydrogen is a reducing agent as expressed (in line 16, column 6) is the reducing gas.

8. Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Baum et. al. USPN 5,783,716.

Regarding claim 1, Baum et. al. teach: *(i) positioning the semiconductor device within a chemical vapor deposition chamber*, as substrate (line 56, column 7) in CVD reactor (line 40, column 7); *(ii) introducing a platinum precursor gas into the chemical vapor deposition chamber for a first period of time so as to deposit a platinum conductive layer on the device*, as precursor compound shown in column 7, lines 2-9, using vapor flash delivery system as suggested by lines 13-15, column 4, i.e. the liquid is volatilized (line 36, column 4) (see also lines 36-40, column 7 and lines 65, column 7 through to line 10, column 8) is therefore gas for a first period of time, *(iii) introducing a reactant into the chemical vapor deposition chamber for a second period of time, so that organic waste compounds contacting the platinum conductive layer are removed to thereby facilitate subsequent deposition of the platinum conductive layer*, as in the presence of oxidizing gas (line 46, column 7), *and (iv) continuing acts (ii) and (iii) until the conductive layer of a desired thickness is achieved,* thickness less than or equal to 200 nm as expressed in lines 7-10, column 10.

Regarding claim 2, Baum et. al. teach: *the method of Claim 1, wherein introducing the platinum precursor gas into the chemical vapor deposition chamber comprises introducing a platinum precursor gas into the chemical vapor deposition chamber wherein the platinum is bonded to a methyl compound so as to improve the step coverage of the platinum precursor gas when forming the conductive layer*, as the

compound (A) shown in column 7, lines 2-9, volatized is in gas form (line 36, column 7), wherein R is a methyl lines 11-12, column 7 for compound(A).

Regarding claim 3 Baum et. al. teach: *the method of Claim 2, wherein introducing the platinum precursor gas comprises introducing a (methylcyclopentadienyl trimethyl) platinum gas into the chemical vapor deposition chamber,* as compound (A) when R is methyl, as per above, for claim 2, and R'(prime) is methyl as can be expressed in lines 14-15, column 7 is *methylcyclopentadienyl trimethyl platinum* in gas form i.e. is as vapor as in line 37, column 7.

Regarding claim 4, Baum et. al. teach: *the method of Claim 1, wherein introducing the reactant into the chemical vapor deposition chamber comprises introducing the reactant both simultaneously with the platinum precursor gas and sequentially to the platinum precursor gas*, as compound introduced in any of the examples 1-10 of columns 8-10, wherein 'thermally decomposed', (line 21-22, column 8) 'in the presence of O2/N2O', (line 13, column 9) 'in an O2/N2O mixture' (line 32, column 8) and 'reacted' (line 43, column 9), is mentioned, indication of at least simultaneous and sequential meeting of the reagent with the oxidizer that may already be present.

Regarding claim 5, Baum et. al. teach: *the method of Claim 4, wherein the reactant is a reducing agent,* since reducing gases are mentioned in lines 50-51, column 7.

Regarding claim 6, Baum et. al. teach: *the method of Claim 4, wherein the reactant is an oxidizing agent*, as oxidizing agent - oxidizing gas (line 46, column 7) as listed in lines 24-25, column 5.

Regarding claim 7, Baum et. al. teach: *the method of Claim 4, wherein introducing the reactant comprises introducing a reactant selected from the group comprising* ***N_2O, O_2, NH_3,*** *NO, H_2O and* ***ozone***, since, of these, the following matches are in bold: **O_2**/N_2O as mentioned in line 13, column 9 and **O_3** (in line 44-45, column 9), i.e. **ozone** as mentioned in line 25-26, column 5, and **N_2O**, line 26, column 5, or, hydrogen (H_2) or **ammonia** (i.e. is **NH_3**) in line 51, column 7.

Allowable Subject Matter

9. Claims 9-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: There was no teaching in the prior art of *the providing of the reactant* ***after halting*** *the precursor.*

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Tao et. al., USPN 5,104,684 teach that when H_2 was added to Ion beam deposition it was not helpful to rid organics (line 34-35, column 5).

Kirlin et. al. USPN 5,204,314 teach a flash CVD processing/apparatus delivery.

Kaesz et. al. USPN 5,403,620 codeposit Pt with W.

Watkins et. al. USPN 5,789,027 teach CFD (adds CO_2 with H_2 for reduction of precursor).

Marsh USPN 5,990,559 teaches roughned Pt; and Marsh USPN 6,204,172 uses Me(cylcopentadienyl)Pt$(Me)_3$ and an oxidizing agent (see clms 8-9).

Buskirk et. al. USPN 6,010,744 pretreats with methyl OH (line 4, column 6).

Todd et. al. USPN 6,146,608 teach FTIR or NMR for volatile byproducts.

Baum et. al. USPN 6,162,712 teach the Pt CVD with precursor.

Gaughan et. al. USPN 6,210,745 teach RGA process monitoring.

Vaartstra USPN 6,329,286 teaches conformal Iridium.

Kawano et. al. USPN 6,605,735 teach MOCVD Ruthenium.

Li et. al. teach two reactant source in US Pgpub 2003/0100183.

Norman et. al. USPN 5,322,712 teach precursor and copper complex of volatile ligand or hydrate of the ligand for Copper CVD.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael K. Luhrs whose telephone number is 571-272-1874. The examiner can normally be reached on M-F, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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